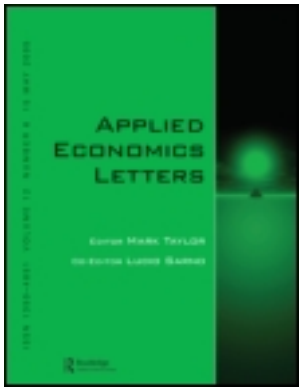

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Facial masculinity predicts risk and time preferences in expert chess players

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In this study, we examine the relationship between risk-taking, impatience and facial masculinity in expert chess players. We combine a large panel data set from high-level chess games with measures of both risk-taking and impatience in chess with facial masculinity, a proxy for testosterone exposure in puberty. We find that male players with high pubertal testosterone exposure are more impatient by playing shorter chess games. For female players, we find that facial masculinity is negatively correlated with risk-taking.

Keywords: risk preferences; time preferences; chess; gender differences

JEL Classification: D03; J16

I. Introduction

There is substantial variation between and within individuals when it comes to both risk preferences, defined by the trade-off between variance and expected value, and impatience, defined as putting more emphasis on sooner compared to later. What explains individual variation in these preferences? A number of recent papers point to the importance of both nature and nurture, with a burgeoning literature studying the role of hormones (e.g. Apicella *et al.,* 2008). We explore whether risk-taking and impatience among international expert chess players with substantial experience can be predicted by an objective measure of facial masculinity. Facial masculinity is considered to be an indicator of pubertal exposure to testosterone, since many masculine craniofacial features develop during puberty under the influence of testosterone (Johnston *et al.,* 2001).[1] Testosterone exposure at various stages in life has, in particular, been linked with risk-taking; for example, Apicella *et al.* (2008) find that facial masculinity (as well as circulating testosterone) correlates positively with economic risk-taking among men. Thus, here, we expect facial masculinity to predict not only risk-taking in particular, but also impatience (though this is more exploratory), especially in men. We find that male players with higher facial masculinity and thus higher exposure to pubertal testosterone are more impatient, while for women, there is a negative correlation between facial masculinity and risk-taking.

II. Data

We use international expert chess games data from ChessBase. We also construct a new data set on objective facial masculinity, generated by specialized software,

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[1] Evidence comes from, for example, Verdonck *et al.* (1999), who find that boys with delayed puberty have delayed craniofacial development compared to a control group, and delayed puberty boys who receive low doses of testosterone over a year show a significantly higher rate of growth in these features compared to the control group.

producing measurements from photos of 264 chess players. We analyse games played between 1997 and 2007, where the minimum Elo rating for each included player is set to 2000, above which players are considered to be experts. We only include players for whom headshot photos were available. There were more male players with photos available than female players, so we selected all female players between the ages of 25 and 34 with photos and all male players from every third year within that range with photos. We use these photos to determine objective facial masculinity measures that we acquired through Psychomorph software (Tiddeman *et al.*, 2001). With this software, we took four measures (identical to Little *et al.*, 2008), that were combined into a single facial masculinity score, where a high score is an indication of a greater degree of masculinity. These measurements have previously been found to be sexually dimorphic (i.e. differ substantially between men and women) (Penton-Voak *et al.*, 2001; Little *et al.*, 2008). All relevant landmarks have to be visible in the photos in order to be rated. This leaves us with a total sample of 128 men and 136 women.

III. Risk and Impatience in Chess

There are three possible results in chess: a win, a draw (a tie) and a loss, which give one point, half a point and zero points, respectively. The fact that draws are possible makes chess suitable for studying risk preferences. A draw can be offered by a player at any time during the game. A risk-averse player, under *ceteris paribus* conditions, has higher preferences for a draw than a risk-loving player as a draw gives half a point with certainty rather than playing for a win with the risk of losing. To increase the winning probability, a player must accept a higher level of risk, which reduces the drawing probability and increases the winning/losing probabilities. By the use of chess data, chess players are aware of the risk premiums they have to pay for a certain risk level. For instance, with 30%/40%/30% (win/draw/loss) probabilities between two equally skilled players (expected performance = 0.50), a player must accept a decrease in expected performance to increase risk, e.g. 40%/15%/40% with an expected performance of 0.475. In this article, we employ the risk measure developed in Gerdes and Gränsmark (2010), who created a variable indicating whether a player has chosen a risk-loving, risk-neutral or risk-averse strategy. We analyse a binary-outcome variable: one if risk-loving, zero otherwise. An advantage with chess data is that the playing skill of each chess player is measured by the so-called Elo rating system, which is an objective and transparent measure of playing skill. In addition, the Elo rating is constructed in such a way that the Elo difference between two players corresponds to an exact expected score (performance) for each player. We can, thus, control for players being differently skilled in chess. A typical question used in lab experiments when studying time preferences is,'Would you prefer \$100 today or \$110 a year from now?' Implicitly, chess players have to ask themselves a similar question every time they are to move, by deciding whether they prefer half a point (a draw) now or the expected score later. If a superior player faces an expected score of 0.6, she has to ask herself whether she prefers 0.5 now to 0.6 later. Since 0.6 is the expected score, she doesn't know with certainty that she will have 0.6 later, but given that we can control for the effect arising from risk preferences, this question is related to the one typically asked in the lab for time preferences. Controlling for risk preferences, impatient players should play shorter games (fewer moves) than less impatient players. Gränsmark (2012) also finds that subjectively impatient players play significantly shorter games than less impatient players. We, thus, use the number of moves in each game as a proxy for impatience, where fewer moves imply more impatience.

IV. Results

In Table 1, columns 1 and 2, we present the results from regressions with risk-loving chess strategies as the outcome variable. The masculinity coefficient for men is positive, albeit far from significant. The results for women indicate a statistically significant negative correlation between facial masculinity and risk-loving strategies ($p = 0.063$); however the measured effect is rather small.[2]

In columns (3) and (4), we also show the main results for the impatience proxy (number of moves) as the dependent variable regressed on facial masculinity. Facial masculinity has a coefficient of –1.08 for men, which should be interpreted as male players with masculine faces playing approximately one-move shorter games. This finding suggests that pubertal testosterone exposure correlates positively with impatience. The effect is statistically significant ($p = 0.059$). The corresponding coefficient for women is non-significant.

V. Conclusions

We find that male players who score higher on objective facial masculinity, which is used as a proxy for pubertal testosterone exposure, play significantly shorter games measured in moves, and thus are more impatient, but do

[2] The effect for women is not statistically different from that for men.

Table 1. Risk-loving (=1, 0 otherwise) strategies and impatience in chess (#moves)

	Risk-loving		Impatience	
	MEN	WOMEN	MEN	WOMEN
	(1)	(2)	(3)	(4)
Elo	0.0001	−0.0001	0.0106	0.0151
	(0.0001)	(0.0002)	(0.0036)***	(0.0028)***
Facial masculinity	0.0259	−0.0087	−1.0846	−0.0784
	(0.0299)	(0.0046)*	(0.5692)*	(0.1053)
Age	0.0054	−0.0395	0.1114	−0.4867
	(0.0347)	(0.0184)**	(0.7704)	(0.5124)
Age squared	−0.0001	0.0008	0.0000	0.0043
	(0.0007)	(0.0004)**	(0.0169)	(0.0108)
Teenage	0.0180	−0.0264	0.0075	0.6967
	(0.0165)	(0.0142)*	(0.6126)	(0.4771)
Log number of games	0.0032	−0.0178	−0.2178	−0.4428
	(0.0133)	(0.0112)	(0.4012)	(0.3384)
Female opponent	0.0185	−0.0203	2.1646	2.1422
	(0.0144)	(0.0092)**	(0.7182)***	(0.3380)***
Risk-loving opponent	0.0966	0.1741	1.6460	−0.2508
	(0.0286)***	(0.0330)***	(0.8458)*	(0.6452)
Elo points at stake	0.0041	−0.0051	0.1619	0.1408
	(0.0044)	(0.0056)	(0.1478)	(0.1082)
Elo difference	0.0000	−0.0000	−0.0003	−0.0001
	(0.0001)	(0.0001)	(0.0026)	(0.0024)
White pieces	0.0342	−0.0207	−0.2813	−0.1287
	(0.0213)	(0.0173)	(0.2174)	(0.2182)
Attractiveness	0.0200	0.0156	0.1179	−0.1612
	(0.0159)	(0.0138)	(0.4446)	(0.2826)
Number of moves	0.0004	0.0000	–	–
	(0.0002)**	(0.0002)		
Risk-loving strategy	–	–	0.5967	0.0231
			(0.2720)**	(0.2977)
Constant	−0.1065	0.9718	13.5890	16.0543
	(0.4689)	(0.4863)**	(11.6411)	(7.9801)**
Observations	28 589	28 325	28 589	28 325
Number of players	128	136	128	136

Notes: *, ** and *** significant at 10%, 5% and 1% levels, respectively.
Robust SEs in parentheses.

not choose riskier chess opening strategies. For women, we find a slightly negative association between facial masculinity and risk-taking. We expected a positive correlation between facial masculinity and risk-taking in men, given the result of Apicella *et al.* (2008), showing a positive correlation with risk-taking measured from an incentivized gamble in a sample of about 100 young men. Perhaps our more heterogeneous sample in terms of age and background leads to more noise, making our sample too small to detect a significant correlation. It is also puzzling that there are differences in the correlations between facial masculinity and behaviour for men and women. Masculine facial features correlate positively with testosterone in males, whereas feminine features correlate positively with oestrogen in females. To what extent masculine features in women reflect testosterone exposure is less clear, and needs to be explored further. Also, it is often assumed that high facial masculinity in a man is a costly signal of 'quality' such as good health, since testosterone has a negative impact on the immune system (Folstad and Karter, 1992). This may lead facial masculinity to have different effects in men and women. Future work should also look at the effects of current testosterone levels on risk-taking and impatience in chess.

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